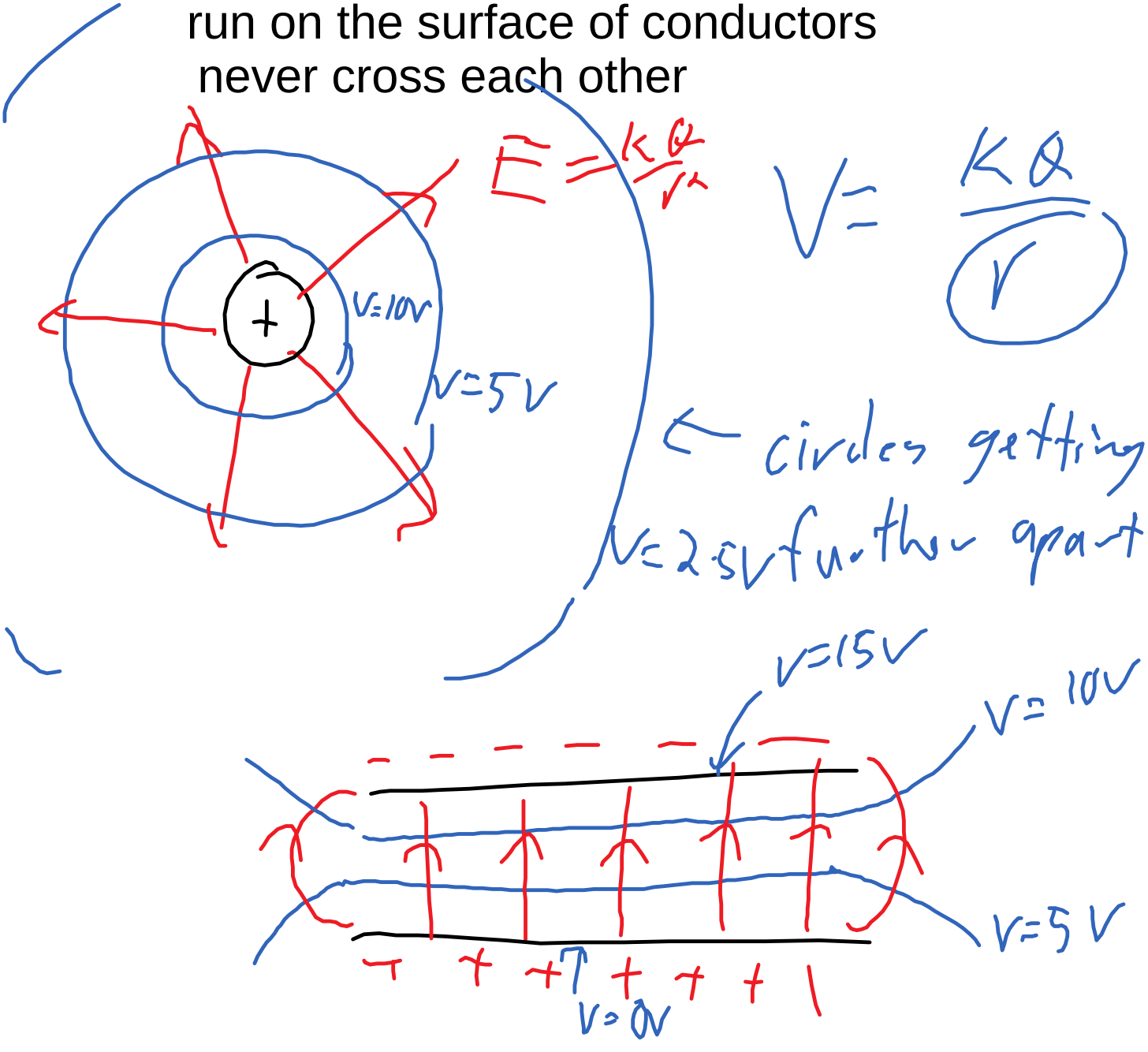
Equipotential lines(finish electrostatics) Circuits intro/review

Equipotential lines - lines of constant potential - potential is the energy per unit charge

rules: perpendicular to electric field lines
run on the surface of conductors
never cross each other



Voltage is potential energy per unit charge that can be transformed into other forms, like kinetic energy or heat or light.

$V = energy/q$

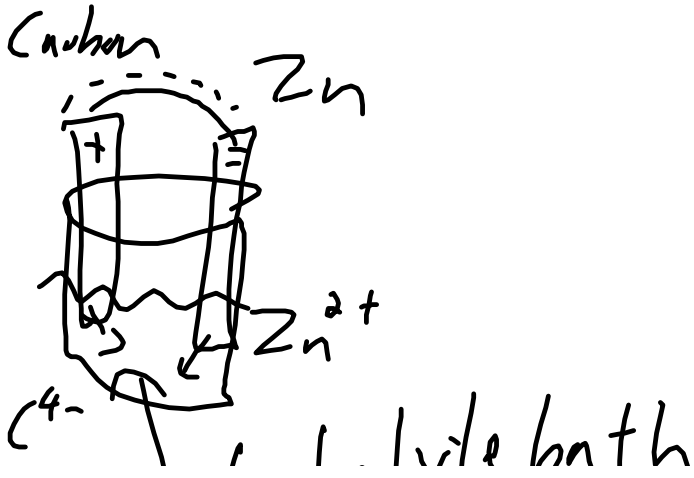
$E_k = Vq$ for the accelerating plate of the cathode ray tube

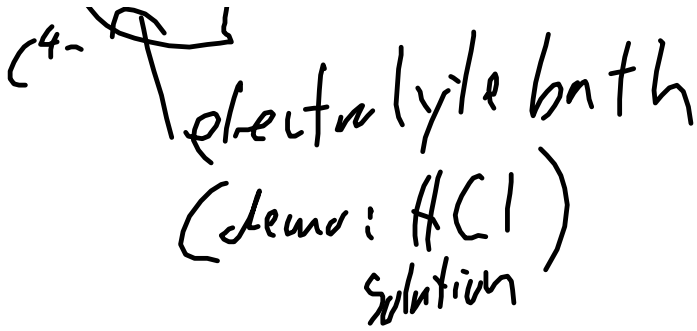
Electric Circuits

Story:

Galvani - iron and copper in frog caused it to jump. Though he had discovered the "life force" - Frankenstein?

Volta - the energy is from the metals, not the animal - recreate the concept with an electrochemical cell.





you can get a steady current flowing between the terminals,
Anode: positive terminal
Cathode: negative terminal

the terminals have a build up of charge, resulting in a potential difference, V.

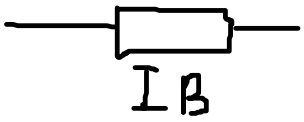
eg. carbon and zinc was about 1.4V
it depends on the chemical properties of the metals, not other factors.

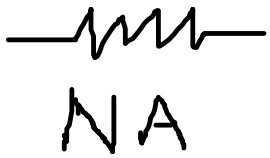
the current, I, is the amount of charge passing per unit time - direction is the direction of positive charge for conventional current. (opposite the flow of electrons!!!! watch out!!)

I = q/t units: Ampère, A=C/s (A is the SI base unit, C is the derived unit because easy)

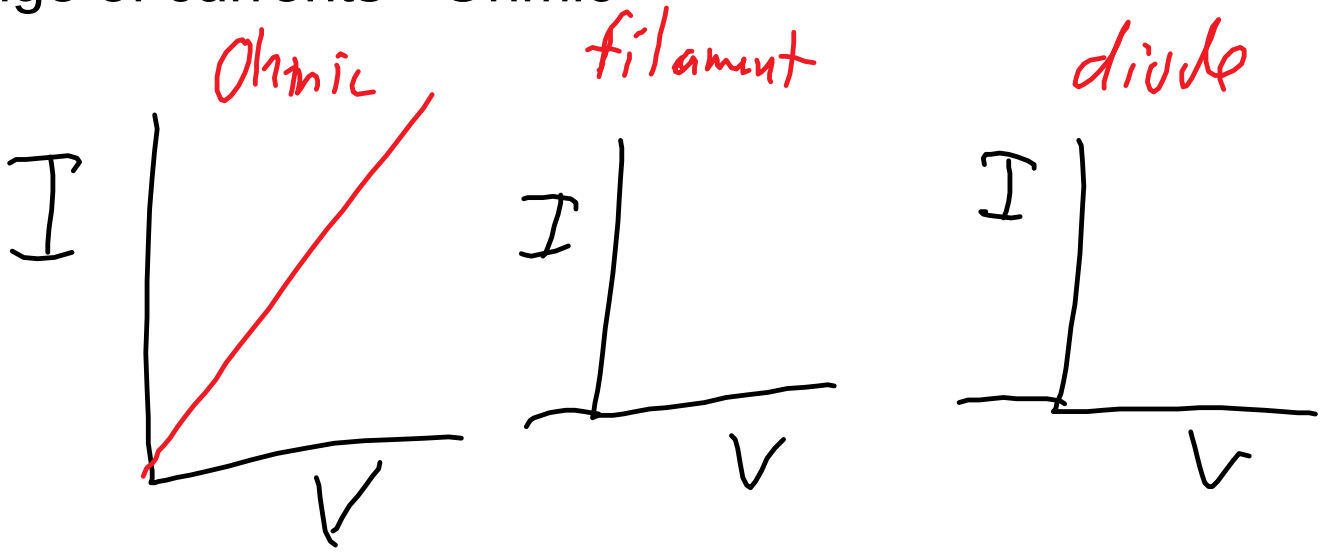
Resistance, R the ratio of Voltage across a circuit element to the current through the element. R=V/I units: Ohm, $\Omega = V/A$

Resistor





device that dissipates electrical energy as heat, usually with a constant Resistance over a range of currents - Ohmic



eg. You connect a 1.5V electrochemical cell to a resistor and an ammeter (measures current).

The ammeter reads 30.0 mA.

a) what is the resistance of the resistor?
b) what is the amount of charge passing the resistor in 5.0 s?
c) How many electrons pass in that time?
d) How much energy is dissipated by the resistor in that time? Where does it go?
e) derive the equation for the power dissipated by an electrical element given V, I or R.

p477 Q1-9 start with Q9 for a challenge

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